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9 Standard Maintenance Procedures

Overview

Within USIA, the Bureau of Broadcasting's Engineering Telecommunications Directorate (B/EBM) is responsible for maintaining each TVRO system in an operational state. In support of this responsibility, B/EBM has established preventive and corrective maintenance contracts for TVRO systems. Preventive maintenance will be performed by contracted personnel on each system every one to two years depending on posts and areas. Corrective maintenance will performed as required by contracted personnel.

The following Scheduled Maintenance Checklist and Severe Weather Checklist are to be used to help you conduct evaluations of outdoor TVRO system components. These checklists can be part of an overall site-specific TVRO preventive maintenance program.

The scheduled maintenance checklist is categorized by every month and six-month time intervals. The severe weather checklist is categorized by specific weather conditions.

Scheduled Maintenance Checklist

Monthly Checklist

1. Check the tightness of the entire antenna's mounting structure nuts and bolts.
2. Inspect the surface of the antenna reflector. Wash off excessive dirt and/or debris using a high-pressure water hose and a soft brush attached to a long pole.
3. Inspect the antenna reflector and mounting structure for signs of corrosion. Remove any rust with a steel brush and apply a base coat of anti corrosive paint followed by a finish coat of exterior paint.
4. Check for blockage of the antenna by trees or new construction.
5. Check the feedhorn assembly. Remove any debris, insects, or bird nests.
6. Inspect the cabling from the LNB to the junction box for any cuts or loose connections. Examine the cable conduit and all of its connections to ensure they are watertight and in good condition.
7. Run the antenna between its east and west limits while inspecting all limit and safety switches for proper operation.
8. Check the azimuth and elevation positions as well as the offset angle.
9. If a pressurized feedhorn or cabling is used, check the volume of dry air or nitrogen left in their storage cylinders.
10. Inspect the attachment of the grounding straps to their grounding rods for tight, corrosion-free connections.

Six-Month Checklist

1. Perform all monthly checks.
2. Lubricate all bearings, hinge joints, and thrusters as indicated by the manufacturer.
3. Remove the actuator motor(s) from the gear reduction unit and check for corrosion. Remove any oxide found, lubricate the 3/8" bolt, and re-install the motor.
4. Inspect the receiver chassis for mechanical damage and evidence of overheating. The receiver should not be operated in environments where airflow is restricted or temperatures are outside the range of 0°C to 50°C.
5. Ensure that the receiver chassis is free of dust and debris. Allow proper ventilation in and around the unit. If necessary, vacuum the unit with a non-metallic brush, or wipe it with a soft cloth moistened with a glass cleaner. Take care to avoid liquids or excess moisture penetrating the unit.

Severe Weather Checklist

Ice and Snow

1. Examine the surface of the antenna dish for dents, rust, or rippled mesh.
2. Check the LNB and the signal feed support structure for damage, twists, or off-axis position.
3. Clean the de-icer heater filter(s) and examine ducts for dirt and obstructions.
4. Check the antenna's azimuth and elevation positions and its offset angle.
5. Examine all cableways and suspended wires for torn or stressed cables and broken supports.

Wind

1. Check the LNB and its support structure for twists, bends, or off-axis position.
2. Check the antenna's azimuth and elevation positions, particularly king post base units.
3. Check the feedhorn assembly. Remove any debris, insects, or bird nests.
4. Examine all cableways and suspended wires for torn or stressed cables and broken supports.
5. Check the tightness of the entire antenna's mounting structure nuts and bolts.
6. Check for loose dish segments or stiffeners.
7. On warning of severe windstorms, move the antenna on azimuth/elevation (AZ/EL) systems to the "bird bath" position.

Rain or High Humidity

1. Check all connections for corrosion or dampness and reseal if necessary.
2. Check the plumb of the antenna base or king post antenna mounts.
3. Check the integrity of underground cables by performing resistance checks on them.
4. Inspect the antenna reflector and mounting structure for signs of corrosion. Remove any rust with a steel brush and apply a base coat of anti corrosive paint followed by a finish coat of exterior paint.

New Satellite Positioning and Recording

To receive signals from a new satellite, enter the satellite's positional data into your positioner or tracker, move the antenna, acquire the signal, and then optimize the reception of the signal by the TVRO system.

USIA will provide you with the following new satellite signal information:

- The type of satellite;
- The intermediate frequency (IF);
- The signal polarity;
- Your site's geographical coordinates; and
- The satellite's coordinates.

Review the satellite-locating steps outlined in the manuals for your system receiver and positioner or tracker.

1. Apply power to the TVRO system.
2. Enter the type of satellite into the positioner or tracker by following the steps presented in Chapter 5, Positioners/Trackers.
3. Enter the new satellite's IF setting into the positioner or tracker by following the steps presented in Chapter 5, Positioners/Trackers.
4. For TVRO sites in the American Republics, turn the polarity controller on and set it for the signal polarity of the new satellite.
5. Select an east-to-west or west-to-east scan path on the positioner or tracker depending on whether the new satellite is located to the east or to the west of your present position. Move the antenna in the direction selected until the new satellite's position has been reached.
6. Watch the system receiver's signal meter and jog the antenna to the east or to the west. Stop moving the antenna when the highest signal-meter reading is reached.

   As you move the antenna away from the signal-meter's highest reception position, the video flashes displayed on the monitor become weaker until no longer present. Return the antenna to the highest peak signal reception position.
7. Watch the system receiver's signal meter and adjust the positioner/receiver's video polarity controller.
8. Adjust the positioner's and/or receiver's video output control for the best picture.
9. Adjust the positioner's and/or receiver's audio output control for the best sound.

10. Enter the satellite's longitudinal setting into the positioner or tracker.

    If this is an inclined orbit satellite, enter the satellite's latitudinal setting into the tracker.

11. Record the satellite's information onto your site's Satellite Log sheet.

    An example of a site's Satellite Log Sheet is shown in Table 9.1.

Table 9.1 is an example of a Satellite Log sheet listing programmed satellites at a specific TVRO site. Letters available for programming additional satellites are A, D, E, F, G, S, T and W. New codes for additional satellites are created by combining one of these letters with a number from 1 to 9.

A blank Satellite Log sheet can be found at the end of this chapter, that you can copy and use to create a Satellite Log for your site's programmed satellites.

TABLE 9.1, SATELLITE LOG SHEET

SATELLITE CODE	SATELLITE NAME	SATELLITE LONGITUDE	POLARITY FORMAT	N O T E S
A1	WORLDNET AOR	27.5W	RHCP/LHCP	TR 15 (RHCP)
S4	INTELSAT F4	34.5W	RHCP/LHCP	Occasional video
E1	PANAMSAT 1	45W	V/H	TR1 CNN (V)
S5	INTELSAT F13	53W	RHCP/LHCP	TR20&22 (RHCP)
S2	SPACENET 2	69W	V/H	TR1 (WEAK) (V)
T2	TELSTAR 302	85W	V/H	TR16 CBS (V)
E2	MORELOS 1	113.5W	V/H	TR2&11 (V)
S1	SPACENET 1	120W	V/H	TR5 (V) (WEAK)
W5	WESTAR 5	122.5W	V/H	TR2 (V) (WEAK)
F3	SATCOM 3	131W	V/H	VERY WEAK
G1	GALAXY 1	134W	V/H	TR2 (V) (WEAK)
T1	STORAGE POSITION FOR HIGH WINDS			

A = ANIK M = MORELOS
D = COMSTAR O = OTHER
E = EXTRA satellites S = SPACENET
F = SATCOM T = TELSTAR
G = GALAXY W = WESTAR
K = KU BAND

Peak Solar Outages Determination

Twice each year, in the spring and in the fall, the sun passes directly behind each WORLDNET satellite. During these passes, the sun's radiated energy in the microwave frequency band is much greater than the microwave energy being transmitted by the satellites. Each solar passage takes five days.

- Two days before the peak solar outage day, you will see:

  A slight degradation of the signal for about 10 minutes when the sun passes close to the satellite. This is seen as a gradual increase and then decrease in black and white sparkles in the program video;

- The day before the peak solar outage day, you will see:

  Signal degradation that is greater and for a longer period of time, approximately 20 minutes;

- On the peak solar outage day, you will see:

  Signal degradation begins approximately 20 minutes before the peak time of the outage and continues to increase until the picture and sound are completely lost for about 10 minutes. This total loss of signal represents the peak day and time of the solar outage for your site. The time of the complete outage will be different in the spring than it is in the fall. As this is happening outside at the antenna, you can see the shadow of the feedhorn crossing the center of the antenna indicating that the sun is in exact alignment behind the satellite. The picture and sound will then slowly begin to reappear with decreasing signal degradation lasting for about 20 minutes until the picture is back to normal; and

- For two days after the peak day of solar outage, you will see signal degradation decrease.

  The exact dates and Greenwich mean times (GMT) of the outages depend on each site's geographical coordinates and the satellite's longitudinal location in orbit over the equator. Table 9.2, Peak Day of Solar Outage, and Table 9.3, Peak Time Range of Solar Outage, list possible ranges of dates and times for each satellite. TVRO sites with low antenna look angles pointing east will have their peak outage times at the earlier end of their listed time range. Sites with low antenna look angles pointing west will have their peak outage times at the later end of their listed range. Sites with high antenna look angles will be somewhere in the middle. For example, sites in Mexico using the Atlantic Ocean region (AOR) satellite will have peak outage times closer to 1300 hrs GMT, while sites in east Africa using the same satellite will have peak outage times closer to 1440 hrs GMT.

  Published solar outage dates for inclined orbit satellites may vary by as much as plus or minus two days if the time of the solar outage is coincident with the extremes of the satellite's inclination.

Solar outage information should be posted in a prominent location in your system control room. It can be rather embarrassing to have an audience experience this phenomena during an interactive broadcast. Therefore, do not schedule an interactive broadcast within this five-day period of the solar outage. Solar outage information is also critical when recording other program material and receiving the wireless file and subcarrier information via satellite.

TABLE 9.2, PEAK DAY OF SOLAR OUTAGE

TVRO SITE LATITUDE	SPRING	FALL
65 Degrees North	February 27	October 14
60 Degrees North	February 28	October 13
55 Degrees North	March 1	October 12
50 Degrees North	March 2	October 11
45 Degrees North	March 3	October 10
40 Degrees North	March 5	October 8
35 Degrees North	March 6	October 6
30 Degrees North	March 8	October 5
25 Degrees North	March 10	October 3
20 Degrees North	March 12	October 1
15 Degrees North	March 14	September 28
10 Degrees North	March 16	September 26
5 Degrees North	March 19	September 24
0 Degrees	March 21	September 22
5 Degrees South	March 23	September 19
10 Degrees South	March 25	September 17
15 Degrees South	March 28	September 15
20 Degrees South	March 30	September 13
25 Degrees South	April 1	September 11
30 Degrees South	April 3	September 9
35 Degrees South	April 4	September 7
40 Degrees South	April 6	September 5
45 Degrees South	April 7	September 4
50 Degrees South	April 8	September 3

TABLE 9.3, PEAK TIME RANGE OF SOLAR OUTAGE

SATELLITE	SATELLITE LONGITUDE (°)	HOURS GMT	
Eutelsat – Serbian Service	10 E	1030	1230
Eutelsat Hotbird	13 E	1020	1200
Intelsat IOR	57 E	0720	0900
ASIASAT 2	100.5 E	0430	0610
Intelsat AOR	27.5 W	1300	1440
New Skies 806	40.5 W	1355	1535
GE 2	85 W	1650	1830

Peak Solar Outage Day and Time Ranges Determination

The peak day of solar outage will be the same for all satellites that you receive; the solar outage time ranges will vary from satellite to satellite. Once you calculate the exact times for each satellite, this information will vary less than one minute per decade (as long as the same WORLDNET satellite is used). Use the following steps to determine peak solar outages.

1. Use Tables 9.2 and 9.3 to determine the approximate peak day of solar outage and time ranges.
2. Prepare a VCR to record through the expected time period for five consecutive days beginning two days before the calculated peak day of solar outage.
3. Set the VCR to start automatically at least one half-hour before the expected outage time range and record continuously for 3 hours.

∫	If the expected peak day of solar outage for your site's location and WORLDNET satellite is March 5th, and the outage time range is between 13:00hrs and 14:00hrs GMT, set the VCR to begin automatic recording of the WORLDNET satellite signal on March 3rd at 12:30hrs GMT and continue recording until 15:30hrs GMT. Continue daily automatic recordings of the WORLDNET signal through March 7th.

4. Analyze each daily VCR recording by playing the tape back through a TV set. Identify the exact time of the total loss of both the picture and sound.
5. Record the peak day of solar outage and its times for both spring and fall outages in a prominent location in your system control room.
6. Mark your WORLDNET interactive planning calendar so that scheduling of interactive broadcasting will not coincide with these periods.

Blank Satellite Log Sheet

SATELLITE CODE	SATELLITE NAME	SATELLITE LONGITUDE	POLARITY FORMAT	N O T E S
	STORAGE POSITION FOR HIGH WINDS			